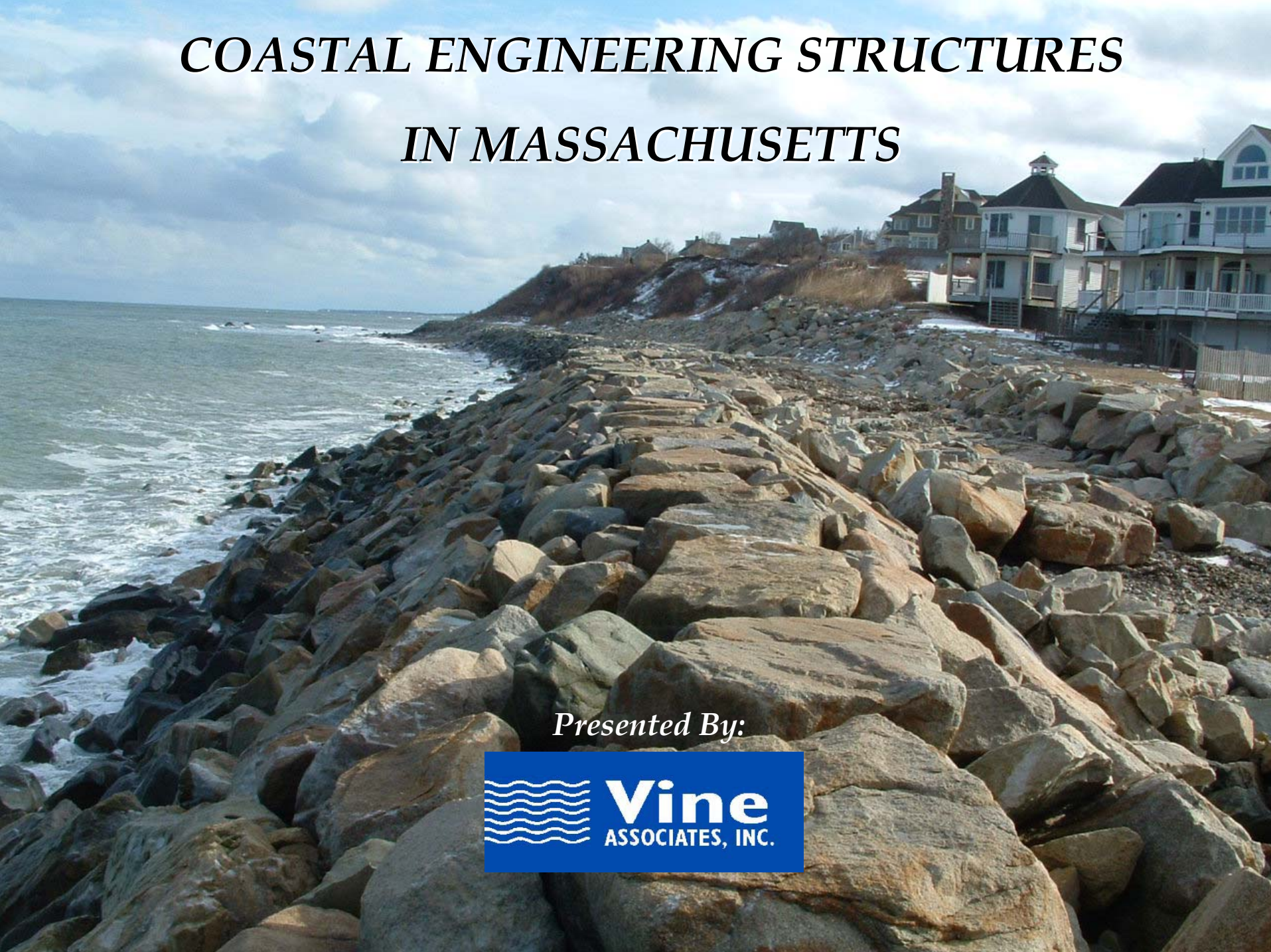
COASTAL ENGINEERING STRUCTURES IN MASSACHUSETTS



Presented By:

Vine
ASSOCIATES, INC.

MA Coastal Engineering Structures

General Information

- Approximately 192 miles of General Coastline in MA
- Approximately 1,519 miles of Tidal Shoreline in MA
- Many Public Shoreline Protection Structures Originally Constructed in Mid to Late 1800s & Early 1900s
- Original Structures – Constructed by Municipalities, State, Federal Government (USACE)

MA Coastal Engineering Structures

Purpose of Structures

- Provide Protection

  Homes, Buildings, Roadways, Utilities

- Provide Commercial & General Public Access

MA Coastal Engineering Structures

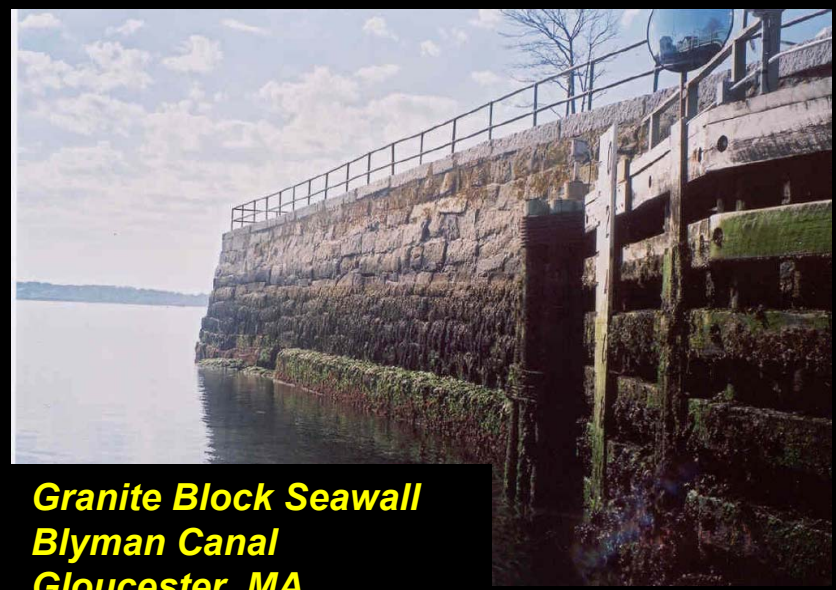
Common Structure Types

» Seawalls
» Revetments
» Breakwaters, Jetties & Groins
» Piers & Wharfs
» Bulkheads
» Stairways, Access Ramps, Boat Ramps
» Boardwalks
» Tide Gates

MA Coastal Engineering Structures

Concrete Seawall
Lynn Shore Reservation
Lynn, MA

SEAWALLS



Granite Block Seawall
Blyman Canal
Gloucester, MA

MA Coastal Engineering Structures

Point Allerton - Hull, MA

SEAWALL & REVETMENT

STONE REVETMENT

Fourth Cliff - Scituate, MA

MA Coastal Engineering Structures

Federal Breakwater
Plymouth Harbor
Plymouth, MA

East & West Federal Jetties
Green Harbor Marshfield, MA

BREAKWATERS, JETTIES & GROINS

Mortared Stone Groin
"The Five Sisters"
Broad Sound Winthrop, MA

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PIERS & WHARFS

Timber Pier - George's Island
Boston Harbor Islands

Timber Wharf - Lynn Heritage State Park
Lynn, MA

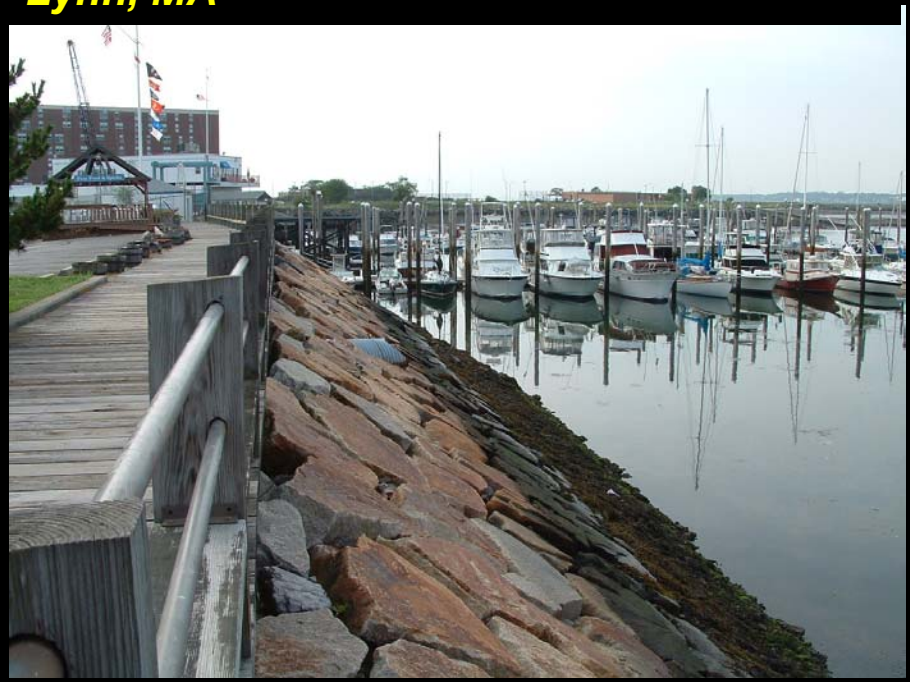
MA Coastal Engineering Structures

Timber Bulkhead - Green Harbor Entrance Channel
Marshfield, MA

BULKHEADS

MA Coastal Engineering Structures

Timber Boardwalk & Stone Revetment
Lynn Heritage State Park
Lynn, MA



Boardwalks

MA Coastal Engineering Structures

Self Regulating Tide Gate (SRT)
Town Brook Flood Control
Revere, MA

Stop Log Structure
Black's Creek Flood Control
Quincy, MA

Flood Control Structures

MA Coastal Engineering Structures

Typical Causes of Damage

- Storm and Wave Impacts
- Erosion
- Ice Damage
- Natural Aging Process

MA Coastal Engineering Structures

Common Types of Damage

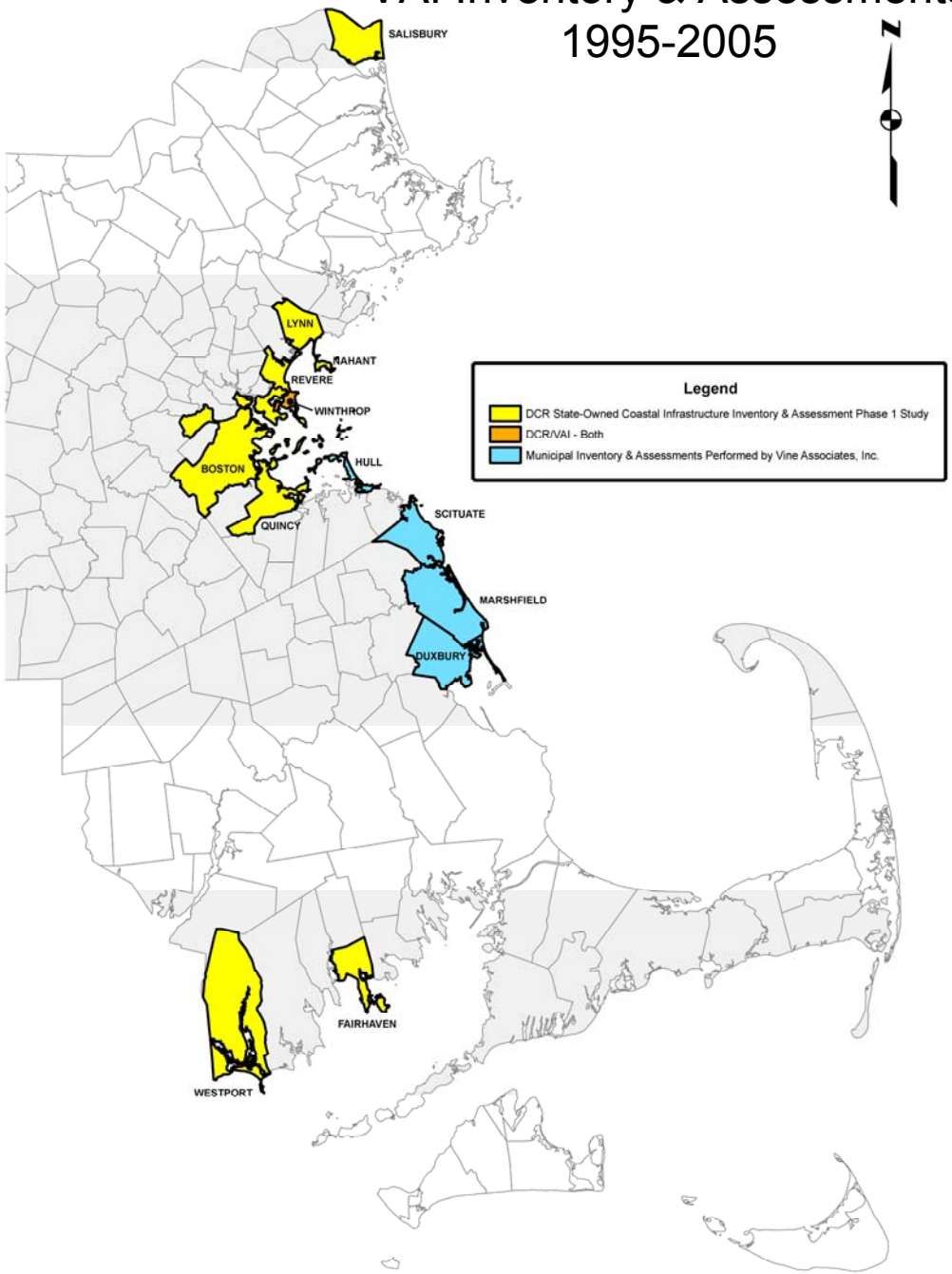
- Cracking & Spalling
- Raveling
- Weathering, Checking, Splitting
- Undermining & Scour
  - Sinkholes
  - Settlement
- Section Loss
- Failure

MA Coastal Engineering Structures

INVENTORY & ASSESSMENT

- Identifies ownership, location and baseline conditions
- Establishes history of structure(s)
- Provides a rational approach for evaluating and prioritizing sites to assist in developing a maintenance program and budgeting schedule
- Establishes baseline conditions for FEMA/MEMA storm damage funding assistance

VAI Inventory & Assessments 1995-2005



MA Coastal Engineering Structures

Priority Index Rating System

5-Letter System using A thru D and F

A – "Excellent Condition"

F – "Critical Condition"

MA Coastal Engineering Structures

Priority Index Rating System

Rating	Physical Condition	Definition Based Upon Perceived Immediacy of Action and Potential to Cause Damage if Not Corrected	Course of Action Required
A	Excellent	New Condition	None
B	Good	Structure observed to exhibit very minor problems, superficial in nature.	None
C	Fair	Structure is sound but may exhibit minor deterioration, section loss, cracking, spalling, undermining, and/or scour.	Minor/Routine
D	Poor	Structure exhibits advanced levels of deterioration, section loss, cracking, spalling, undermining, and/or scour. Structure should be monitored until repairs/reconstruction can be initiated.	Significant
F	Critical	Structure exhibits critical levels of deterioration, section loss, cracking, spalling, undermining, and/or scour. Stability is severely compromised, rate of deterioration is increasing, and structure does not provide required level of protection or function. Conditions of structure may warrant emergency stabilization as failure may result in potential loss of property and/or life.	Immediate

MA Coastal Engineering Structures

PRIORITY INDEX RATING

A

Savin Hill Beach Seawall - Boston, MA

MA Coastal Engineering Structures

PRIORITY INDEX RATING

B

Stone Revetment – Pleasure Bay Causeway Boston, MA

MA Coastal Engineering Structures

PRIORITY INDEX RATING

C

Granite Block Seawall with Concrete Overlay
Nahant Causeway
Nahant, MA

MA Coastal Engineering Structures

PRIORITY INDEX RATING

D

Granite Block Seawall – Great Brewster Island
Boston Harbor Islands

MA Coastal Engineering Structures

PRIORITY INDEX RATING

F

Concrete Seawall – Cadish Avenue
Hull, MA

MA Coastal Engineering Structures

GENERAL PROCEDURE

1. Identify Publicly-Owned Structures
2. Obtain Existing Available Record Information
3. Establish Structure Identification System
4. Perform Visual Inspection
5. Evaluate Existing Conditions
6. Assign Priority Index Rating
7. Identify Improvements/Cost Estimate
8. Establish Maintenance Program

MA Coastal Engineering Structures

INVENTORY & ASSESSMENT REPORT FORM

5 Key Components:

1. Identification/Ownership
2. Location
3. Description
4. Investigative Findings
5. Improvements

MA Coastal Engineering Structures

Inventory & Assessment Report Form

1. **IDENTIFICATION**

Information typically included:

- » **Location - Area or Town/City**
- » **Structure Identification Number**
- » **Structure Type**
- » **Priority Index Rating**
- » **Location and Conditions Plan**
- » **State Plane Coordinates (structure limits only)**
- » **Photographs**

MA Coastal Engineering Structures

Inventory & Assessment Report Form

2. LOCATION

Information typically included:

- » **Geography & Site Characteristics**
- » **Identification of FEMA Flood Zone**
- » **Tidal Data (MHW, AHTL, etc.)**
- » **Maps**

MA Coastal Engineering Structures

Inventory & Assessment Report Form

3. DESCRIPTION

Information typically included:

- Structure Type
- Structure Dimensions
- Record Plan/License Information
- Typical Cross Section
- Identification of Prior Repair History

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Inventory & Assessment Report Form

4. INVESTIGATIVE FINDINGS

Information typically included:

- » Field Investigations – Limited to Visual Observation, General Field Measurements, Photographs
- » Evaluation & Analysis of Conditions
- » Assignment of Priority Index Rating

MA Coastal Engineering Structures

Inventory & Assessment Report Form

5. **IMPROVEMENTS**

for **A** and **B** Index Rating - N/A

for **C**, **D**, and **F** Index Rating

- » Level 1 – Short Term
- » Level 2 – Intermediate
- » Level 3 – Full Replacement

MA Coastal Engineering Structures

Inventory & Assessment

Massachusetts Geographic Information Systems

MA GIS

STATION	COORDINATES (FEET)
0+00	810235,2942481
3+16	810252,2942169
8+08	810363,2941855
11+50	810544,2941565
16+78	810824,2941181
21+28	811134,2941490
23+13	811287,2941387
26+52	811435,2941666
45+09	810587,2942915
48+42	810254,2942902

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SCALE: 1"=300' | JANUARY 2005

LOCATION MAP

GEORGE'S ISLAND BOSTON HARBOR

GEIS-LM

Vine Associates, Inc.	CONDITIONS MAP	GEORGE'S ISLAND BOSTON HARBOR	GEIS–CM
SCALE: 1"=300'	JANUARY 2005		

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MA Coastal Engineering Structures

BENEFITS OF INVENTORY & ASSESSMENT

- **Assists in Establishing Long-Term Maintenance Program**
- **Provides Guidance for Establishing Capital Budget**
- **Establishes Baseline Conditions**

MA Coastal Engineering Structures

MAJOR CHALLENGES & ISSUES

- Establishing Ownership & Maintenance Responsibilities of Structures
- Availability of Funding
- Finding a Practical Balance Between Environmental Impacts and Function & Protection Provided by Structures
- Standard Approach